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CAB-O-SIL® DIVISION

CABOT

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January 2, 1985

Mark A. Haney, Manager
Facilities Compliance Unit
Compliance Monitoring Section
Division of Land Pollution Control
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

REF: 04180801 -- Douglas County
Tuscola/Cabot Corporation
Subpart F Groundwater Monitoring

Dear Mr. Haney,

Enclosed please find our "Assessment of Annually Collected Groundwater Saples, RCRA Impoundment, Cabot Corporation Plant, Tuscola, Illinois." Also enclosed is a proposed modification to our "Groundwater Quality Assessment Program" which we submitted in January 1984.

The proposed modifications are related to the expansion of the groundwater monitoring system and the hazardous waste parameters to be analyzed. Please let us know if these modifications meet with Agency approval so we may implement them as soon as possible.

Sincerely,

Gabriel Paci
Manager, Environmental Affairs
CAB-O-SIL Division

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ASSESSMENT OF ANNUALLY
COLLECTED GROUNDWATER SAMPLES
RCRA IMPOUNDMENT
CABOT CORPORATION PLANT
TUSCOLA, ILLINOIS

(U.S. EPA I.D. No. ILD042075333)

Date: December 1984

Prepared by: Rauf Piskin, Ph.D., C.P.G.

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ASSESSMENT OF ANNUALLY COLLECTED GROUNDWATER SAMPLES

INTRODUCTION

This report is the annual assessment of groundwater quality for the hazardous waste impoundment at the Cabot Corporation plant near Tuscola, Illinois. The report has been prepared to satisfy the requirements of Section 725. 193(d) (5), Subpart F: Groundwater Monitoring (IPCB, 1984).

Groundwater quality assessment reports are to be prepared as indicated in "Groundwater Quality Assessment Program at Cabot Corporation Plant, Tuscola, Illinois", as amended (Hydropoll, 1984a). The assessment program had been prepared to satisfy the requirements of Section 725. 193(d) (2) and submitted to IEPA in February 1984. In the supplements to the assessment program, the hazardous waste constituents to be analyzed were identified, the number of wells in the monitoring system were modified, and a new schedule of sampling and analysis was established. These modifications were approved by the IEPA. Previous to this annual report, a quarterly assessment report was submitted to the IEPA in September, 1984.

The purpose of this report is to assess the rate and extent of migration and the concentration of hazardous waste constituents in the groundwater beneath the plant property in vertical and horizontal directions based on the annual sampling.

Monitoring System

As approved by the IEPA, nine wells out of thirteen make up the monitoring system for the impoundment at the Cabot plant (Figure 1). Of these, MW-1 (G101) is the upgradient well and the rest are downgradient. MW-9 (G109) and MW-13 (G113) are the deep monitoring wells which are installed to assess vertical migration of hazardous waste constituents.

Hazardous Waste Constituents

"Groundwater Quality Assessment Program", as amended, (Hydropoll, 1984a) requires that four hazardous waste constituents are to be identified in the groundwater samples from the monitoring wells in the plant property. These constituents are:

Bis (2-Ethyl-Hexyl) Phthalate

Carbon Tetrachloride

Tetrachloroethylene

Methylene Chloride

Parameters Analyzed and Assessment Methods

Prior to collecting water samples, depth to water was measured and water level elevations were determined in all monitoring wells at the plant. The annual samples were collected from the nine monitoring wells on October 15, 1984. These samples were analyzed for the groundwater quality indicator parameters, the four hazardous waste constituents and the indicator parameters of ground-

water contamination. In addition to the four hazardous waste constituents, six more parameters were identified in the samples. The results of the analyses were submitted to the IEPA on December 5, 1984. The results are also summarized in Tables 2, 4, and 5.

Indicator Parameters of Groundwater Pollution

The means for each indicator parameter were calculated. These means were compared with their corresponding initial background means using the Student's t-test at the 0.01 level of significance to determine statistically significant increases (decreases, in the case of pH. Each well sampled for the annual assessment was considered individually and compared with the initial background means of the upgradient well (G101).

Student's t-Distribution

The value of Student's t-distribution with n-1 degrees of freedom is expressed by the following equations (Alder and Roessler, 1964):

$$t = \frac{\bar{X} - m}{Sx} \qquad \text{where,} \quad (1)$$

$$Sx = \frac{s}{\sqrt{n}} \qquad (2)$$

t = value of t for n-1 degrees of freedom

$\bar{X}$ = mean of the measurement, it is the mean of the annual analysis in this case,

m = mean of the sample, it is the mean of the background in this case,

s = best estimate of the standard deviation of the sample where $n \leqslant 30$, it is the standard deviation calculated for the background in this case,

Sx = best estimate of the standard deviation of the mean of sample,

n = number of variates in a sample, it was 16 of initial background,

Vf = degree of freedom; it is n-1 or 15.

Calculation of t Values for Indicator Parameters

Utilizing the above equations, t values are calculated for specific conductance as below:

S = 47.53 (Table 2)

m = 1361 (Table 2)

$$Sx = \frac{S}{\sqrt{n}} = \frac{47.53}{\sqrt{16}} = \frac{47.53}{4} = 11.88$$

$$t = \frac{\bar{X} - m}{Sx} = \frac{\bar{X} - 1361}{11.88}$$

Place, $\bar{X}$, mean conductance values measured annually (Table 2) into the above equation and solve for t.

The calculated t values are listed in Table 3. The value of t 0.01 for Vf =15, taken from statistical tables, is also included in Table 3. Similarly, t values have been calculated from the equations (1) and (2) for TOC, TOX and pH. These calculated values and their corresponding t 0.01 values from statistical

tables are also shown in Table 3.

Parameters Establishing Groundwater Quality

The analysis results of the groundwater quality parameters from the monitoring wells will be compared with the means of the initial background concentrations in the upgradient well. The comparisons will assist to determine whether sources other than the disposal facility are causing groundwater contamination at the Cabot Corporation plant. The mean initial background concentrations of the parameters are based on the four quarterly samples analyzed during the first year of monitoring.

Hazardous Waste Constituents

Comparisons of the analysis results from the downgradient wells with those from the upgradient well will be made to determine whether the hazardous waste constituents have entered groundwater from the impoundment. The chemical analysis results and velocity calculations based on a modified Darcy's formula will be utilized to estimate the extent of migration of the hazardous waste constituents. The rate of groundwater flow from the impoundment and at the eastern property of the plant property will be estimated from the Darcy's formula.

ASSESSMENT

Potentimetric Levels, Flow Direction and Hydraulic Gradient

When the annual groundwater samples were collected, the elevation of groundwater was determined in all the monitoring wells (Table 1). Based on the elevations taken from the shallow wells, a potentiometric map has been prepared (Figure 1) and the direction of regional groundwater flow has been estimated from elevations in MW-1 (G101), MW-10 (G110) and MW-11 (G111). The regional flow direction is towards southeast and the hydraulic gradient is 0.009 (4 ft/425 ft) in the unaffected areas. This flow direction and the hydraulic gradient are reasonably in agreement with those determined previously (Hydropoll, 1984b).

Figure 1 indicates that a groundwater mound has formed beneath the impoundment. The mound has been created due to migration of waste fluid from the impoundment. Migration of waste fluid has changed groundwater elevations, general flow direction and the hydraulic gradient near the impoundment. From Figure 1, it is estimated that the distortion of groundwater contours occurred to a distance of 250 ft in the regional flow direction from the impoundment. The hydraulic gradient averages 0.028 in this affected area. This is also reasonably comparable with the 0.024 value which had been determined in the previous assessment reports (Hydropoll, 1984b).

Table 1. Depth to and elevation of water levels in all monitoring wells at the Cabot Plant

WELL NUMBER	Ground Elevation, Ft	MEASUREMENT			Level difference in paired wells, Ft
		Depth to water, Ft	Elevation of* water level, Ft	Measurement Date	
(MW-1) G101	693.44	2.50	690.94	10/15/84	
MW-2	690.68	3.75	686.93	10/15/84	
MW-3	690.87	3.33	687.54**	10/15/84	
MW-4	686.90	3.91	682.99**	10/15/84	
MW-5	694.04	4.73	689.31	10/15/84	
(MW-6) G106	691.84	2.33	689.51**	10/15/84	19.34
(MW-9) G109	691.59	21.42	670.17**	10/15/84	
(MW-7) G107	690.60	4.25	686.35	10/15/84	
(MW-8) G108	691.14	3.67	687.47	10/15/84	
(MW-10) G110	689.66	3.25	686.41	10/15/84	9.11
(MW-13) G113	689.05	11.75	677.30	10/15/84	
(MW-11) G111	686.64	4.33	682.31	10/15/84	
(MW-12) G112	690.97	5.00	685.97	10/15/84	

* Water elevation is above MSL

** Elevations have been corrected and are different than those which were submitted to the IEPA with the Cabot's letter dated December 5, 1984.

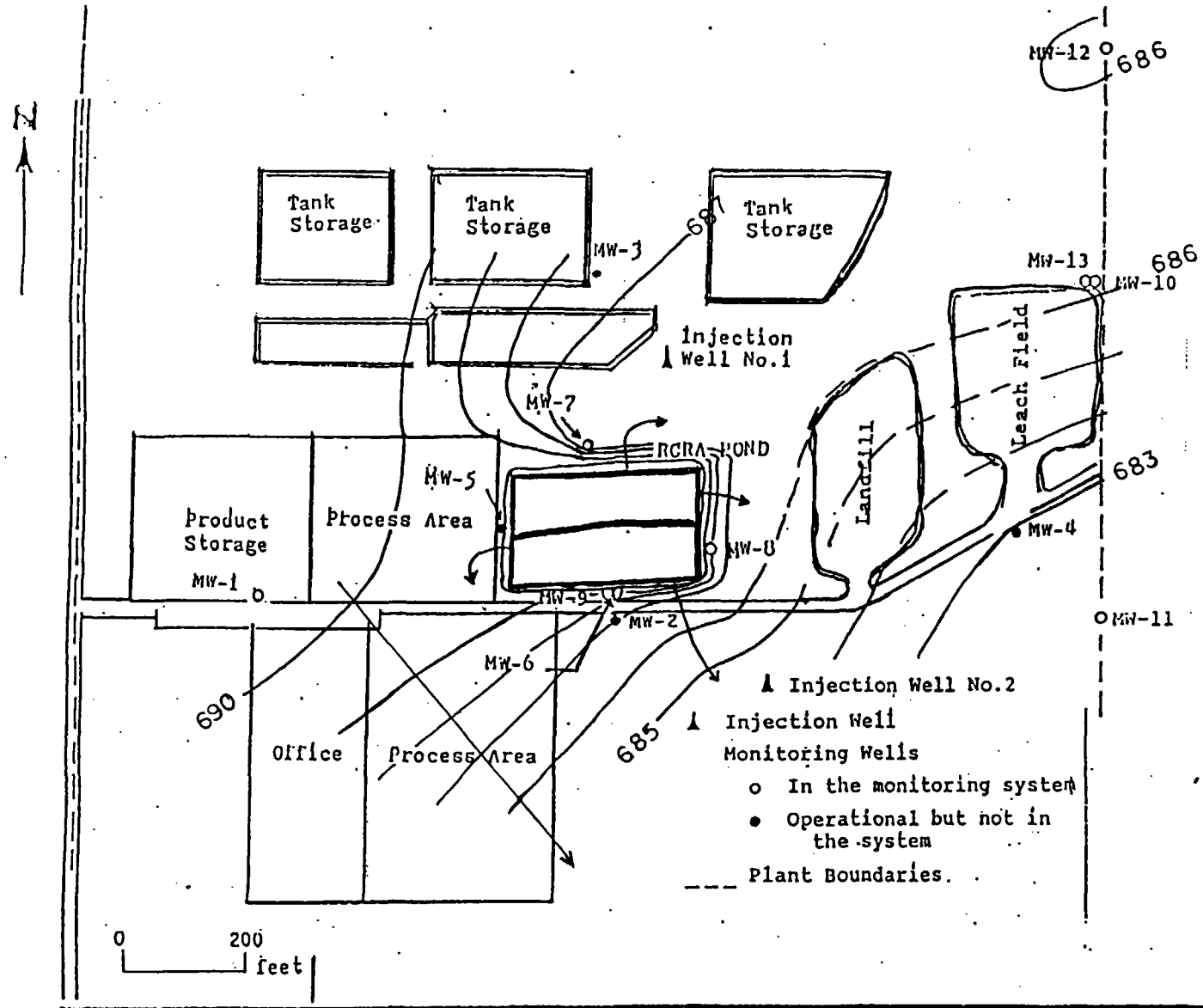

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Figure 1. Potentiometric map based on October 15, 1984 water level elevations, Cabot Corporation plant, Tuscola, Illinois. Contour interval is one ft and elevations are above msl.

Indicator Parameters of Groundwater Contamination

The analyses results of groundwater contamination parameters and their initial background concentrations are in Table 2. The t values of these parameters are calculated and indicated in Table 3. Comparison of the calculated t values of the indicator parameters of groundwater contamination with the published t values at the 0.01 level of significance indicate that the hazardous waste impoundment has been leaking. The waste fluid which leaked from the impoundment has contributed to the underlying groundwater.

Only TOX show a significant change at G101 (Table 3). This change in the background well is caused by an outside source located at the west, upgradient from the well. All the indicator parameters change significantly at the shallow downgradient wells, G106, G107, and G108, located very closely to the impoundment. Conductance, TOC and TOX increased significantly while pH decreased significantly. The impoundment is the primary source of the significant changes in groundwater in the vicinity of the impoundment.

The potentiometric map (Figure 1) indicates that the above three wells could be affected by the impoundment. The conclusion reached from the statistical analyses above are in agreement with the water level measurements, which shows a groundwater mound and migration of waste fluids from the impoundment.

Table 2. Initial background, and measured values, arithmetic means (x), variances and standard deviations of groundwater contamination indicator parameters of annually collected groundwater samples on 10/15/84

rameter		(G101) (Initial Background)	G101	G106	G107	G108	G109*	G110*	G111*	G112*	G113*
	1st measurement		7.66	2.05	6.12	2.21	6.60	7.29	7.51	7.34	12.45
	2nd measurement		7.66	2.06	6.13	2.20					
	3rd measurement		7.66	2.06	6.14	2.20					
	4th measurement		7.67	2.05	6.13	2.21					
h, unit											
	Mean	7.34	7.6625	2.055	6.13	2.205					
	Variance	0.0058	0.0000188	0.000025	0.00005	0.000025					
	Standard deviation	0.076	0.005	0.005773	0.00816	0.005773					
	1st measurement		704	40800	44400	48600	2920	1020	1130	784	7290
	2nd measurement		704	40800	44400	48600					
	3rd measurement		699	42500	44400	48600					
nductivity mhos/cm	4th measurement		699	40800	44400	48600					
	Mean	1360.62	701.5	41225	44400	48600					
	Variance	2259.58	6.25	541875	0	0					
	Standard deviation	47.53	2.89	850	0	0					
	1st measurement		14	108	31	150					
	2nd measurement		14	107	31	150					
	3rd measurement		15	106	33	140					
	4th measurement		13	106	32	140					
C, mg/l											
	Mean	13.9875	14	106.75	31.75	145					
	Variance	22.2145	0.5	0.6875	0.6875	25					
	Standard deviation	4.71	0.82	0.96	0.96	5.77					
	1st measurement		0.178	8.08	3.03	3.10					
	2nd measurement		0.182	13.08	3.08	5.54					
	3rd measurement		0.163	7.46	3.27	3.92					
	4th measurement		0.153	7.38	4.35	4.96					
X, mg/l											
	Mean	0.051875	0.169	9	3.4325	4.38					
	Variance	0.0005097	0.00014	5.62	0.29	0.883					
	Standard deviation	0.023	0.014	2.74	0.62	1.85					

* Monitoring of these wells is not required. Analyses are provided for information.

Table 3. Calculated t values of indicator parameters of groundwater contamination, and comparison with their t 0.01 values published, the Cabot Corporation plant, Tuscola, Illinois.

Monitoring Well No	pH		Conductivity		TOC		TOX	
	Calculated (t)	t0.01 = 2.947	Calculated (t)	t0.01 = 2.602	Calculated (t)	t0.01 = 2.602	Calculated (t)	t0.01 = 2.602
G101	16.97		- 5.51		0.0085		20.35	Increase
G106	-278.	Decrease	3556.	Increase	78.61	Increase	1556.	Increase
G107	- 63.68	Decrease	3623.	Increase	15.05	Increase	588.	Increase
G108	-270.	Decrease	3976.	Increase	111.	Increase	753.	Increase

Parameters Establishing Groundwater Quality

The concentrations of the groundwater quality parameters in the samples from the monitoring wells and the mean of the initial background concentrations in the upgradient well (G101) are presented in Table 4. The means of the initial background concentrations are based on the four quarterly samples taken during the first year of monitoring (Hydropoll, 1984c).

The analysis results in Table 4 indicate that the concentrations in G101 are considerably lower in the annual samples than those in the initial background. Contrarily, the concentrations in the shallow downgradient wells (G106, G107 and G108) next to the impoundment are higher than the means of the initial background concentrations, except phenol in G107 and sulfate in both G107 and G108. The annual samples from the shallow monitoring wells (G110, G111 and G112) along the eastern plant boundary show lower concentrations of the parameters analyzed than the initial background means, except chloride in G111.

The chloride, iron and phenol concentration in the downgradient deepwell (G109) are lower than those in G106, which is next to G109. However, the higher concentrations of iron and chloride and a lower concentration of phenol occur in G109 in contrast to those of the initial background concentrations. The other deepwell, G113, located along the eastern boundary of the plant, shows lower

Table 4. Initial background and concentrations of parameters establishing groundwater quality in the groundwater samples taken from the monitoring wells on 10/15/84, Cabot Corporation plant, Tuscola, Illinois.

Parameters	G101		G101	G106	G107	G108	G109**	G110**	G111**	G112**	G113**
	* Initial Background										
	Range	Mean									
Chloride, mg/l	144-162	155.5	72	16240	17110	21490	650	120	180	71	36
Iron, diss., mg/l	2.9-23	9.025	0.23	980	30	1700	19	0.07	<0.01	0.21	1.0
Manganese, diss., mg/l	0.43-1.4	0.925	0.28	36	66	46					
Phenols, total, µg/l	1.0-5.0	2.15	1.1	7.2	1.7	4.4	1.4	<1	<1	<1	4.6***
Sodium, diss., mg/l	22-30	25.75	16	110	140	130					
Sulfate, diss., mg/l	208-252	234	120	300	26	140					

* Initial background based on the four quarterly measurements made during the first year.

** Monitoring of these wells is not required. Analyses are presented for information.

*** High value due to test interference.

chloride and iron and higher phenol concentrations than the initial background means. However, lower chloride and higher iron and phenol concentrations are in G113 as compared to those in G110 which is the shallow well next to G113.

Analysis of groundwater quality parameters shows what had been indicated by the analysis of the groundwater contamination indicator parameters; that is, the RCRA impoundment has been leaking. The leakage has caused high concentrations of chloride, iron, manganese, and sodium in the immediate downgradient wells. Higher sulfate concentration in the upgradient well than those in the immediate downgradient wells demonstrates existence of another source with high sulfate at the west of the upgradient well. Relatively high concentrations of chloride along the eastern boundary of the plant suggest presence of other sources, such as leachfield, landfill and/or others.

Contaminated groundwater has traveled downward through the till near the impoundment. However, the deeper groundwater might not have been contaminated along the eastern boundary. The high concentration of phenol in G113 might be caused by cross contaminaton.

Hazardous Waste Constituents

Review of the analysis results in Table 5 indicates that three of the four hazardous waste constituents were measurable and have entered groundwater. The four hazardous waste constituents were

Table 5. Concentrations of hazardous waste constituents in the groundwater samples taken from the monitoring wells on 10/15/84, Cabot Corporation plant, Tuscola, Illinois

	G101	G106	G107	G108	G109	G110	G111	G112	G113
Carbon tetra chloride µg/l	<1	<1	13	430	<1	4	3	2	<1
Methylene chloride µg/l	<1	24	<1	7	<1	<1	<1	<1	<1
Tetrachloroethylene µg/l	<1	1300	75	550	76	31	30	20	<1
Bis (2-Ethyl hexyl) phthalate µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	<1	<1	9	<1	17	9	8	<1	15
Toluene	<1	<1	<1	38	<1	4	4	<1	5
*Ethylbenzene	<1	<1	<1	<1	<1	4	4	<1	5
Chloroform	<1	7	7	128	<1	<1	<1	<1	<1
**Di n octyl phthalate	<10	<10	20	17	<10	<10	<10	<10	<10
**Butyl benzyl phthalate	<10	<10	<10	20	30	<10	<10	<10	<10

* It is not in the list of hazardous waste of IPCB (1984)

** They were not present in the previous quarterly analyses

below their respective detection limits in the upgradient well (G101) and in the deepwell (G113) near the eastern boundary of the plant. Bis (2-Ethyl hexyl) phthalate was below its detection limit in all nine wells. The remaining three parameters were measurable in the immediate downgradient wells (G106, G107 and G108) from the impoundment. This indicates that the hazardous waste constituents have primarily migrated from the impoundment and entered groundwater. Furthermore, some of the three parameters were found to be measureable in the other shallow monitoring wells (G110, G112 and G111) located along the eastern boundary of the plant. These might originate from the leachfield and other unknown sources.

The concentrations of the three hazardous waste constituents were relatively low, in ppb level, in the downgradient wells; except, tetrachloroethylene was 1,3 mg/l in G106. While three hazardous waste constituents were below their respective detection limits, tetrachloroethylene was 76 μg/l in the deep monitoring well (G109).

The analysis results in Table 5 are different than those in the quarterly report, September 1984 (Hydropoll, 1984b). Carbon tetra chloride decreased in G106 and G108, increased in G107 and was found for the first time in G110, G111 and G112. Methylene chloride increased in G106 and decreased in G107, G108 and G109. Tetrachloroethylene increased in G107 and decreased in G106, G108 and G109, and was present for the first time in G110, G111 and G112.

The above differences in the immediate downgradient wells would result from seasonal differences, changes of waste concentrations in the impoundment in the past, change in discharge rate from the impoundment and/or sampling and laboratory errors. Presence of hazardous waste constituents in the shallow wells along the eastern boundary of the plant might indicate existence of other sources besides the impoundment.

In addition to the four hazardous waste constituents, six more parameters were identified in the groundwater samples (Table 5). Of these parameters, di n octyl phthalate and butyl benzyl phthalate were found for the first time in the samples. The four parameters (benzene, toluene, ethyl benzene and chloroform) were identified first in the last quarter's analyses (Hydropoll, 1984b).

Rate and Extent of Migration of Hazardous Waste Constituents

Although the analyses in Table 5 do not indicate the extent of groundwater contamination (or location of the contamination front), a review of them in conjunction with the monitoring well location (Figure 1) shows that the groundwater contamination occurred primarily near the impoundment in the downgradient direction.

Groundwater Velocity and Extent of Contamination in Horizontal Direction

The horizontal component of the velocity of the groundwater flow through the glacial till (silty clay) can be estimated using a modified version of the Darcy's equation as below:

$$V_H = K \frac{dh}{dl} \frac{1}{n} \quad \text{, where}$$

V_H = Velocity , ft/yr

*K_F = Field hydraulic conductivity

= 6 x 10^{-5} cm/sec (62.1 ft/yr), (reported previously)

$\frac{dh}{dl}$ = Hydraulic gradient,

n = Effective porosity (assumed 0.05)

The hydraulic gradient in an area unaffected by the impoundment was estimated as 0.009 from Figure 1. Thus, the groundwater velocity is calculated from the above equation as 11.2 ft/yr in this area using K_F.

From a perspective of migration of contaminant, the most important part of the impoundment to consider is the part of the plant property immediately downgradient from the eastern berm of the impoundment. The hydraulic gradient averages 0.028 in the distorted (affected) area. Using the same equation above, the average

* The calculations below were made using only field hydraulic conductivity. If the laboratory hydraulic conductivity was used, results would have been about four order of magnitude smaller.

velocity is calculated as 34.8 ft/yr. That means it would take 7.2 years for a drop of fluid to travel from the impoundment to a point 250 ft away in the regional flow direction. The impoundment has been there for seventeen years, since 1966, and a fluid drop from the impoundment would travel a 250 ft distance in 7.2 years; thus, there is a time period of 9.8 years to travel beyond the 250 ft distance from the eastern side impoundment in the unaffected area. Because the velocity of groundwater is calculated as 11.2 ft/yr in the unaffected area, a drop of fluid from the impoundment would travel 110 ft in 9.8 years beyond the affected area.

Thus, it seems that the fluid that migrated from the impoundment in 1966 would travel approximately a distance of 360 ft in the regional flow direction. The potentiometric surface map in Figure 1 suggests that the travel distance would be shorter than the calculated 360 ft in other directions.

In the calculation of 360 ft, it is assumed that there is no other potential contamination sources. However, a small landfill and leachfield exist east of the impoundment approximately 200 ft and 550 ft away, respectively. Any fluid contribution from these sources would affect the flow direction and the calculated distance.

Groundwater Velocity and Contamination in Vertical Direction

The water elevation data in Table 1 for two pairs of monitoring

wells (MW-6/MW-9 and MW-10/MW-13) indicate that the groundwater beneath the plant property migrates downward. Furthermore, the chemical analysis data in Table 5 suggest a slight contamination of relatively deeper groundwater by tetracholoroethylene in MW-9 (G109) which is 52.5 ft deep. However, the deeper groundwater in MW-13 (G113), located at the eastern boundary of the plant property, does not have any of the four hazardous waste constituents.

The vertical component of the groundwater velocity was estimated by using a modified Darcy's equation and data from these wells. It is assumed that K is constant in horizontal and vertical directions. The modified equation is:

$V_V = K \frac{dh}{dl} \frac{1}{n}$ where,

$\frac{dh}{dl} = 0.932$ for the MW-6/MW-9 pair, and

$\frac{dh}{dl} = 0.259$ for the MW-10/MW-13 pair.

(Other terms expressed before)

Using K_F, V_V would be:

$V_V = 62.1$ ft/yr x $0.932 \times \frac{1}{0.05} = 1158$ ft/yr at MW-6/MW-9, and

$V_V = 62.1$ ft/yr x $0.259 \times \frac{1}{0.05} = 322$ ft/yr at MW-10/MW-13.

If K_L, laboratory measured hydraulic conductivity, (8.3×10^{-9} cm/sec or 8.6×10^{-3} ft/yr), is used, V_V would be:

$V_V = 8.6 \times 10^{-3}$ ft/yr x $0.932 \times \frac{1}{0.05} = 0.16$ ft/yr at MW-6/MW-9 and,

$V_V = 8.6 \times 10^{-3}$ ft/yr x $0.259 \times \frac{1}{0.05} = 0.04$ ft/yr at MW-10/MW-13.

It is clear that the calculated vertical velocity of groundwater is higher than the calculated horizontal velocity. Furthermore, the vertical velocity is higher near the impoundment. This is probably due to higher hydraulic gradient resulting from the groundwater mound under the impoundment.

However, the calculated velocities in the vertical direction seem to be higher for K_F and lower for K_L than would be expected. This is probably due to both differences between K_F and K_L and to the assumption made that K was equal in horizontal and vertical directions. The value of K should be lower with depth due to compaction and lack of weathering. If it is assumed that the contaminants reached to 52 ft depth in MW-9 in seventeen years, V_V is calculated to be 3 ft/yr. At this velocity, K would be about 2.6×10^{-7} cm/sec (0.27 ft/yr) which is probably the average hydraulic conductivity of the till in vertical direction and more reasonable than K_L. Thus, the 3 ft/yr vertical velocity near the impoundment seems to be reasonable, too.

Using $K = 2.6 \times 10^{-7}$ cm/sec, the velocity of groundwater in vertical direction at the location of MW-10/MW-13 is calculated as 2.3 ft/yr.

Rate of Discharge from the Impoundment

Under saturated conditions, the volume of discharge from the bottom of the impoundment can be calculated using the Darcy's

formula. The discharge has been calculated in two ways by using the hydraulic conductivity measured in the laboratory and in the field. The Darcy's formula is:

$Q = K \frac{dh}{dl} A$ where,

Q = Volume of discharge, ft^3/yr

$\frac{dh}{dl}$ = Hydraulic gradient = 0.028 in the affected area

A = Area of the impoundment = 34,000 ft^2

K_F = Field hydraulic conductivity = 6×10^{-5} cm/sec
= 62.1 ft/yr

K_L = Laboratory hydraulic conductivity = 8.3×10^{-9} cm/sec
= 8.6×10^{-3} ft/yr

When the above values introduced into the formula,

Q_F = 62.1 ft/yr x 0.028 x 34,000 ft^2 = 59,119 ft^3/yr
= 442,212 gallon/yr

Q_L = 8.6×10^{-3} ft/yr x 0.028 x 34,000 ft^2 = 8.19 ft^3/yr
= 61.2 gallon/yr

The great difference between the Q_F and Q_L is due to the difference of about four order of magnitude between K_L and K_F.

Rate of Discharge at the Property Boundary

The Darcy's formula is used to estimate this rate. The estimate was made for a unit length, i.e. 100 ft, and a 30-ft saturated thickness. The hydraulic gradient is approximately 0.009 near the boundary. K_F, field conductivity, is used in calculations.

The Darcy's formula is:

$$Q = K_F \frac{dh}{dl} A \quad \text{where,}$$

$$A = 100 \text{ ft} \times 30 \text{ ft} = 3{,}000 \text{ ft}^2$$

$$Q = 62.1 \text{ ft/yr} \times 0.009 \times 3{,}000 \text{ ft}^2 = 1{,}676.7 \text{ ft}^3\text{/yr}$$

$$= 12{,}542 \text{ gallons/yr}$$

Thus, the estimated volume of groundwater flow is 12,542 gallons per year through the upper 30 ft of the saturated zone of the till and along the 100-ft length of the property boundary.

CONCLUSIONS

1. A groundwater mound has formed beneath the impoundment due to migration of waste fluids from the impoundment.

2. Regional flow direction of groundwater is towards southeast.

3. The impoundment has been leaking. The leakage has caused the contamination of the shallow and relatively deep groundwater near the impoundment.

4. It is estimated that the contaminated groundwater flow has traveled a distance of 360 ft in the regional flow direction.

5. The groundwater along the eastern boundary of the plant might be contaminated by sources other than the impoundment.

6. A source located west of the upgradient well has contributed to the groundwater contamination at the Cabot Corporation plant.

7. There are more than four hazardous waste constituents in the contaminated groundwater.

8. The concentrations of the hazardous waste constituents in the groundwater is relatively low, in ppb level, except one analysis which was 1.3 mg/l.

RECOMMENDATIONS

1. Quarterly samples should be collected from the monitoring wells in early January 1985.

2. Water levels in all monitoring wells should be measured in the same day prior to sampling.

3. Prior to the next sampling, "Groundwater Quality Assessment Program" should be amended:
    a. To modify the monitoring system for better assessment of vertical and horizontal migration of the hazardous waste constituents, and
    b. To modify the list of hazardous waste constituents to be analyzed in groundwater samples.

4. To prevent cross contamination, sampling equipment (bailer or pump) should be properly decontaminated prior to sampling of each well.

Prepared by:

Rauf Piskin

Rauf Piskin, C.P.G. 5090
Hydrogeologist

LIST OF REFERENCES

Alder, H.L. and E.B. Roesler. 1964. Introduction to probability and statistics (Third Edition), p.313, W. H. Freeman and Company.

Cabot Corporation Files.

Hydropoll, Inc. 1984a. Groundwater quality assessment program at Cabot Corporation plant, Tuscola, Illinois (as amended, p. 21).

Hydropoll, Inc. 1984b. Assessment of quarterly collected groundwater samples, RCRA impoundment, Cabot Corporation plant, Tuscola, Illinois, p.15, September, 1984.

Hydropoll, Inc. 1984c. Assessment of semi-annually collected groundwater samples, RCRA impoundment, Cabot Corporation plant, Tuscola, Illinois, p.36, January, 1984.

IPCB. 1984. Rules and regulations, Subtitle G: Waste Disposal, p. 194.

APPENDIX

Monitoring Data as Reported by Cabot Corporation

R. Piskin
12-7-84

CAB-O-SIL® DIVISION

CABOT CORPORATION P. O. BOX 188, TUSCOLA, ILLINOIS 61953

TELEPHONE AREA CODE 217
TUSCOLA 253-3370
TELEX TUSCOLA 910-663-2542

December 5, 1984

Mark A. Haney, Manager
Facilities Compliance Unit
Compliance Monitoring Section
Division of Land Pollution Control
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

REF: 04180801 -- Douglas County
Tuscola/Cabot Corporation
Subpart F Groundwater Monitoring

Dear Mr. Haney:

Enclosed please find the results of our most recent groundwater monitoring tests. A copy of these results has been forwarded to Dr. Rauf Piskin, our consulting hydrogeologist, for his assessment. We will be submitting a proposal for additional wells and hazardous constituents along with Dr. Piskin's assessment within the next two weeks.

Sincerely,

Gabriel Paci, Manager
Environmental Affairs
CAB-O-SIL Division

Laboratory Assignments

TEI Analytical, Inc. — Lab ID No. 0005
Park Ridge, IL

- Hazardous Waste Constituents

Daily Analytical Labs — Lab ID No. 7553
Peoria, IL

- Total Organic Halogen
- Iron
- Manganese
- Sodium

Cabot Corporation CAB-O-SIL Division — Lab ID No. 0015
Analtyical Lab
Tuscola, IL

- pH
- Conductivity
- Total Organic Carbon
- Phenol
- Chloride
- Sulfate

JP/cl
11/84

October, 1984 Groundwater Elevation of Monitoring Wells

	Depth to Water (Feet Below Land Surface)	Groundwater Elevation (Feet Above MSL)
G101	2.50	690.94
G102	3.75	686.93
G103	3.33	683.57
G104	3.91	686.95
G105	4.73	689.31
G106	2.33	689.32
G107	4.25	686.35
G108	3.67	687.47
G109	21.42	670.05
G110	3.25	686.41
G111	4.33	682.31
G112	5.00	685.97
G113	11.75	677.30

JP/cl
11/84

Concentrations of Organic Compounds Not Reported As Hazardous Waste Constituents

PPB	G101	G106	G107	G108	G109	G110	G111	G112	G113
Benzene	< 1	< 1	9	< 1	17	9	8	< 1	15
Toluene	< 1	< 1	< 1	38	< 1	4	4	< 1	5
Ethyl Benzene	< 1	< 1	< 1	< 1	< 1	4	4	< 1	5
Chloroform	< 1	7	7	128	< 1	< 1	< 1	< 1	< 1
Di n octyl phthalate	<10	<10	20	17	<10	<10	<10	<10	<10
Butyl benzyl phthalate	<10	<10	<10	20	30	<10	<10	<10	<10

JP/cl
11/84

October, 1984 Additional Data

	G109	G110	G111	G112	G113
pH	6.60	7.29	7.51	7.34	12.45
Conductivity (μmhos/cm)	2920	1020	1130	784	7290
Chloride (mg/l)	650	120	180	71	36
Iron (mg/l)	19	0.07	<0.01	0.21	1.0
Phenol (μg/l)	1.4	<1.0	<1.0	<1.0	4.6

JP/cl
11/84

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36) M ___ / D ___ / Y (41) FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER (9–18): 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER (see Instructions) (19–22): C 1 0 1

REGION: C CO.: DOUGLAS

LOCATION: TUSCOLA RESPONSIBLE PARTY: CABOT CORPORATION

DATE COLLECTED (23–28): M 1 0 / D 1 5 / Y 8 4

IEPA LAB (x or Blank) (see Instructions) (29): MW-1

FOR IEPA USE ONLY

COMPLAINT NO. (30–41): — — — — — —

DATE RECEIVED (42–47): M ___ / D ___ / Y ___

SAMPLING PURPOSE CODE (see Instructions) (48):

TIME CARD PROGRAM CODE (49–52): — — & UNIT CODE (53):

BACKGROUND SAMPLE (X) (54): X

TIME COLLECTED (24 HR CLOCK) (55–58): H 0 9 : M 1 5

UNABLE TO COLLECT SAMPLE (see Instructions) (59):

MONITOR POINT SAMPLED BY (see Instructions) (60): 2 PERISTALTIC OTHER (SPECIFY)

SAMPLE FIELD FILTERED - INORGANICS (X) (61): X ORGANICS (X) (62):

SAMPLE APPEARANCE (63–102): COLORLESS, SLIGHTLY TURBID

COLLECTOR COMMENTS (103–142):

SPECIAL INSTRUCTIONS TO LAB:

COLLECTED BY	INITIALS (143–145)	DIVISION OR COMPANY	TRANSPORTED BY	DIVISION OR COMPANY
J Pruett	J P	Cabot Corp		

LAB USE ONLY

LAB SAMPLE NO.: LAB NAME: LAB ID NO. (146–149):

DATE RECEIVED: AND ADDRESS:

TIME RECEIVED:

SAMPLE TEMP OKAY (Y/N): SAMPLE PROPERLY PRESERVED (Y/N): DATE COMPLETED: FORWARD:

LAB COMMENTS (150–199):

SUPERVISOR SIGNATURE

RECORD CODE: L P C S M 0 2 (1–7) TRANS CODE: A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARKS	REPLICATE	< OR >	VALUE	REPORTING LEVEL: DIGITS TO L OR R	REPORTING LEVEL: L OR R OF DECIMAL
X	DEPTH TO WATER (ft. below LS)	72019 (30–34)	(35)	(36)	(37)	2.50 (38–47)	2 (48)	R (49)
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				62.6	1	R

This Agency is authorized to require this information under Illinois Revised Statutes 1979 Chapter 111 1/2, Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

IL 532-1218
LPC 100 3/84

IEPA/DLPC CHEMICAL ANALYSIS FORM Page 2 of 2

RECORD CODE LPCSM02 (1–7) TRANS CODE A (8)

SITE INVENTORY NUMBER 0418080000 1 (9–18) MONITOR POINT NUMBER G101 (19–22)

REGION C CO. DOUGLAS

DATE COLLECTED 10/15/84 (23 M D Y 28)

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) 29 MW-1

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CNDUCTVY FIELD MICROMHO	00094		1		704	1	L
CNDUCTVY FIELD MICROMHO	00094		2		704	1	L
CNDUCTVY FIELD MICROMHO	00094		3		699	1	L
CNDUCTVY FIELD MICROMHO	00094		4		699	1	L
FIELD PH SU	00400		1		7.66	2	R
FIELD PH SU	00400		2		7.66	2	R
FIELD PH SU	00400		3		7.66	2	R
FIELD PH SU	00400		4		7.67	2	R
T ORG C AS C MG/L	00680		1		14	1	L
T ORG C AS C MG/L	00680		2		14	1	L
T ORG C AS C MG/L	00680		3		15	1	L
T ORG C AS C MG/L	00680		4		13	1	L
SODIUM NA, DISS MG/L	00930				16	1	L
CHLORIDE CL, MG/L	00940				72	1	L
SULFATE SO4, DISS MG/L	00946				120	2	L
IRON FE, DISS UG/L	01046				230	2	L
MANGANESE MN, DISS UG/L	01056				280	2	L
PHENOLS TOTAL UG/L	32730				1.1	1	R
TOX HALOGEN UG/L	78115		1		178	1	L
TOX HALOGEN UG/L	78115		2		182	1	L
TOX HALOGEN UG/L	78115		3		163	1	L
TOX HALOGEN UG/L	78115		4		153	1	L
CARBONTET TOT IN WTR UG/L	32102			<	1	1	L
METHYLENE CHLORIDE T UG/L	34423			<	1	1	L
TETRACHLOROETHYLENE T UG/L	34475			<	1	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L

RECEIVED
JAN 04 1985

IEPA/DLPC

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: LPCSM01 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36 M / D / Y 41) FEDERAL ID NUMBER: ILD 042 075 333

SITE INVENTORY NUMBER: 041 808 000 1 (9–18)

MONITOR POINT NUMBER (see Instructions): G 106 (19–22)

REGION: C CO.: DOUGLAS

DATE COLLECTED (23 M / D / Y 28): 10/16/84

TUSCOLA (LOCATION) CABOT CORPORATION (RESPONSIBLE PARTY)

IEPA LAB (x or Blank) (see Instructions) 29: MW-6

FOR IEPA USE ONLY

COMPLAINT NO. (– – – – – –)

DATE RECEIVED (42 M / D / Y 47)

SAMPLING PURPOSE CODE (see Instructions) 48

TIME CARD

PROGRAM CODE 49 – – 52 & UNIT CODE 53

BACKGROUND SAMPLE (X) 54

TIME COLLECTED (24 HR CLOCK) 55 H 09 : 35 M 58

UNABLE TO COLLECT SAMPLE (see Instructions) 59

MONITOR POINT SAMPLED BY (see Instructions) 60: 2 PERISTALTIC OTHER (SPECIFY)

SAMPLE FIELD FILTERED - INORGANICS (X) 61: X ORGANICS (X) 62

SAMPLE APPEARANCE (63): LIGHT GREEN, CLEAR

COLLECTOR COMMENTS (103): 980,000 µg/l Fe (102 / 142)

SPECIAL INSTRUCTIONS TO LAB

J Pruitt (COLLECTED BY) J P (143 INITIALS 145) Cabot Corp (DIVISION OR COMPANY) ____ (TRANSPORTED BY) ____ (DIVISION OR COMPANY)

LAB USE ONLY

LAB SAMPLE NO. ____ LAB NAME ____ LAB ID NO. 146 – – 149

DATE RECEIVED ____ AND ADDRESS ____

TIME RECEIVED ____

SAMPLE TEMP OKAY (Y/N) ____ SAMPLE PROPERLY PRESERVED (Y/N) ____ DATE COMPLETED ____ FORWARD ____

LAB COMMENTS 150 (199)

SUPERVISOR SIGNATURE

RECORD CODE LPCSM02 (1–7) TRANS CODE A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARK CODE	QUALIFIER	< OR >	VALUE	REPORTING LEVEL: SIGNIFICANT DIGITS TO L OR R	REPORTING LEVEL: LOG R OR OPTIONAL
X	DEPTH TO WATER (ft. below LS)	72019 (30–34)	35	36	37	38 – – – 2.33 – – – 47	2 (48)	R (49)
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				626	1	R

IEPA/DLPC CHEMICAL ANALYSIS FORM

RECORD CODE [L|P|C|S|M|0|2] (1–7) TRANS CODE [A] (8)

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1 (9–18)

MONITOR POINT NUMBER C 1 0 6 (19–22)

LON C CO. DOUGLAS

DATE COLLECTED 1 0 / 1 5 / 8 4 (23 M / D / Y 28)

TUSCOLA / CABOT CORPORATION
LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) (29) MW-6

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	REMARK (35)	FRACTION (36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: ENGLISH UNIT	REPORTING LEVEL: METRIC UNIT
CNDUCTVY FIELD MICROMHO	00094		1		40800	3	L
CNDUCTVY FIELD MICROMHO	00094		2		40800	3	L
CNDUCTVY FIELD MICROMHO	00094		3		42500	3	L
CNDUCTVY FIELD MICROMHO	00094		4		40800	3	L
FIELD PH SU	00400		1		205	2	R
FIELD PH SU	00400		2		206	2	R
FIELD PH SU	00400		3		206	2	R
FIELD PH SU	00400		4		205	2	R
T ORG C AS C MG/L	00680		1		108	1	L
T ORG C AS C MG/L	00680		2		107	1	L
T ORG C AS C MG/L	00680		3		106	1	L
T ORG C AS C MG/L	00680		4		106	1	L
SODIUM NA, DISS MG/L	00930				110	2	L
CHLORIDE CL, MG/L	00940				16240	2	L
SULFATE SO4, DISS MG/L	00946				300	2	L
IRON FE, DISS UG/L	01046	X					
MANGANESE MN, DISS UG/L	01056				36000	4	L
PHENOLS TOTAL UG/L	32730				72	1	R
TOX HALOGEN UG/L	78115		1		8080	2	L
TOX HALOGEN UG/L	78115		2		13080	2	L
TOX HALOGEN UG/L	78115		3		7460	2	L
TOX HALOGEN UG/L	78115		4		7380	2	L
CARBONTET TOT IN WTR UG/L	32102			<	1	1	L
METHYLENE CHLORIDE T UG/L	34423				24	1	L
TETRACHLOROEHTYLENE T UG/L	34475				1300	3	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L
RECEIVED							
JAN 04 1985							

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE (1–7): L P C S M 0 1 | TRANS CODE (8): A

REPORT DUE DATE (36 M / D / Y 41)

FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER (9–18): 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER (see Instructions) (19–22): C 1 0 7

REGION: C CO. DOUGLAS

DATE COLLECTED (23 M / D / Y 28): 1 0 / 1 5 / 8 4

TUSCOLA — LOCATION

CABOT CORPORATION — RESPONSIBLE PARTY

IEPA LAB (x or Blank) (see Instructions) 29: MW-7

FOR IEPA USE ONLY

COMPLAINT NO. (30–41):

DATE RECEIVED (42 M / D / Y 47):

SAMPLING PURPOSE CODE (see Instructions) 48:

TIME CARD PROGRAM CODE (49–52) & UNIT CODE 53:

BACKGROUND SAMPLE (X) 54:

TIME COLLECTED (24 HR CLOCK) (55 H : M 58): 1 1 : 2 7

UNABLE TO COLLECT SAMPLE (see Instructions) 59:

MONITOR POINT SAMPLED BY (see Instructions) 60: 2 PERISTALTIC (OTHER (SPECIFY))

SAMPLE FIELD FILTERED - INORGANICS (X) 61: X ORGANICS (X) 62:

SAMPLE APPEARANCE (63–102): COLORLESS, CLEAR

COLLECTOR COMMENTS (103–142):

SPECIAL INSTRUCTIONS TO LAB:

J. Pruitt — COLLECTED BY (143)

J P — INITIALS (145)

Cabot Corp — DIVISION OR COMPANY

TRANSPORTED BY

DIVISION OR COMPANY

LAB USE ONLY

LAB SAMPLE NO.

LAB NAME AND ADDRESS

LAB ID NO. (146–149)

DATE RECEIVED

TIME RECEIVED

SAMPLE TEMP OKAY (Y/N)

SAMPLE PROPERLY PRESERVED (Y/N)

DATE COMPLETED

FORWARD

LAB COMMENTS (150–199)

SUPERVISOR SIGNATURE

RECORD CODE (1–7): L P C S M 0 2 | TRANS CODE (8): A

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	REMARK (35)	REPLICATE (36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: DIGITS TO L OF R (48)	REPORTING LEVEL: NUMBER OF DECIMAL (49)
X	DEPTH TO WATER (ft. below LS)	7 2 0 1 9				4 2 5	2	R
	ELEVATION OF GW SURFACE (ft. ref MSL)	7 1 9 9 3						
	TOTAL WELL DEPTH (ft. below LS)	7 2 0 0 8						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	0 0 4 3 1						
	REDOX POTENTIAL (millivolt) - Field	0 0 0 9 0						
	pH (units) - Field	0 0 4 0 0						
	SPEC CONDUCTANCE (umhos) - Field	0 0 0 9 4						
	TEMP OF WATER SAMPLE (°F) - Field	0 0 0 1 1				6 6 2	1	R

IEPA/DLPC CHEMICAL ANALYSIS FORM

RECORD CODE LPCSM02 (1–7) TRANS CODE A (8)

SITE INVENTORY NUMBER 041808000 01 (9–18)

MONITOR POINT NUMBER G107 (19–22)

REGION C CO. DOUGLAS

DATE COLLECTED 10/15/84 (23 M, D, Y 26)

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) (29) MW-7

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	AMOUNT CODE (35)	METHOD CODE (36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: SIGN. FIGS. (48)	REPORTING LEVEL: DECIMAL PLACE (49)
CNDUCTVY FIELD MICROMHO	00094		1		44400	3	L
CNDUCTVY FIELD MICROMHO	00094		2		44400	3	L
CNDUCTVY FIELD MICROMHO	00094		3		44400	3	L
CNDUCTVY FIELD MICROMHO	00094		4		44400	3	L
FIELD PH SU	00400		1		6.12	2	R
FIELD PH SU	00400		2		6.13	2	R
FIELD PH SU	00400		3		6.14	2	R
FIELD PH SU	00400		4		6.13	2	R
T ORG C AS C MG/L	00680		1		31	1	L
T ORG C AS C MG/L	00680		2		31	1	L
T ORG C AS C MG/L	00680		3		33	1	L
T ORG C AS C MG/L	00680		4		32	1	L
SODIUM NA, DISS MG/L	00930				140	2	L
CHLORIDE CL, MG/L	00940				17110	1	L
SULFATE SO4, DISS MG/L	00946				26	1	L
IRON FE, DISS UG/L	01046				30000	4	L
MANGANESE MN, DISS UG/L	01056				66000	4	L
PHENOLS TOTAL UG/L	32730				17	1	R
TOX HALOGEN UG/L	78115		1		3030	2	L
TOX HALOGEN UG/L	78115		2		3080	2	L
TOX HALOGEN UG/L	78115		3		3270	2	L
TOX HALOGEN UG/L	78115		4		4350	2	L
CARBONTET TOT IN WTR UG/L	32102				13	1	L
METHYLENE CHLORIDE T UG/L	34423			<	1	1	L
TETRACHLOROETHYLENE T UG/L	34475				75	1	L
BIS(2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L
RECEIVED							
JAN 04 1985							

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36 M / D / Y 41) FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER (9–18): 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER (see Instructions) (19–22): C 1 0 8

REGION: C CO.: DOUGLAS

DATE COLLECTED (23 M / D / Y 28): 1 2 / 1 5 / 8 4

TUSCOLA — LOCATION

CABOT CORPORATION — RESPONSIBLE PARTY

IEPA LAB (x or Blank) (see Instructions) (29): MW-8

FOR IEPA USE ONLY

COMPLAINT NO. (30–35):

DATE RECEIVED (42 M / D / Y 47):

SAMPLING PURPOSE CODE (see Instructions) (48):

TIME CARD

PROGRAM CODE (49–52) & UNIT CODE (53):

BACKGROUND SAMPLE (X) (54):

TIME COLLECTED (24 HR CLOCK) (55 H : M 58): 1 0 : 3 0

UNABLE TO COLLECT SAMPLE (see Instructions) (59):

MONITOR POINT SAMPLED BY (see Instructions) (60): 2 PERISTALTIC (OTHER (SPECIFY))

SAMPLE FIELD FILTERED - INORGANICS (X) (61): X ORGANICS (X) (62):

SAMPLE APPEARANCE (63): AMBER, CLEAR

COLLECTOR COMMENTS (103–142): 1,700,000 µg/l Fe

SPECIAL INSTRUCTIONS TO LAB:

J. Pruitt — COLLECTED BY

I P — INITIALS (143–145)

Cabot Corp — DIVISION OR COMPANY

TRANSPORTED BY

DIVISION OR COMPANY

LAB USE ONLY

LAB SAMPLE NO.:

LAB NAME AND ADDRESS:

LAB ID NO. (146–149):

DATE RECEIVED:

TIME RECEIVED:

SAMPLE TEMP OKAY (Y/N):

SAMPLE PROPERLY PRESERVED (Y/N):

DATE COMPLETED:

FORWARD:

LAB COMMENTS (150–199):

SUPERVISOR SIGNATURE

RECORD CODE: L P C S M 0 2 (1–7) TRANS CODE: A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	REMARK CODE (35)	REPLICATE (36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: UNITS (45)	REPORTING LEVEL: LIMIT OR DETECTION (46)
X	DEPTH TO WATER (ft. below LS)	72019				3.67	2	R
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
X	TEMP OF WATER SAMPLE (°F) - Field	00011				66.2	1	R

IEPA/DLPC CHEMICAL ANALYSIS FORM

RECORD CODE LPCSM02 (1–7) TRANS CODE A (8)

SITE INVENTORY NUMBER 041S08000 1 (9–18) MONITOR POINT NUMBER G108 (19–22)

ION C CO. DOUGLAS DATE COLLECTED 10/15/84 (M/D/Y, 23–25)

TUSCOLA / CABOT CORPORATION IEPA LAB (x or Blank) (29) MW-8

LOCATION RESPONSIBLE PARTY

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CNDUCTVY FIELD MICROMHO	00094		1		48600	3	L
CNDUCTVY FIELD MICROMHO	00094		2		48600	3	L
CNDUCTVY FIELD MICROMHO	00094		3		48600	3	L
CNDUCTVY FIELD MICROMHO	00094		4		48600	3	L
FIELD PH SU	00400		1		2.21	2	R
FIELD PH SU	00400		2		2.20	2	R
FIELD PH SU	00400		3		2.20	2	R
FIELD PH SU	00400		4		2.21	2	R
T ORG C AS C MG/L	00680		1		150	2	L
T ORG C AS C MG/L	00680		2		150	2	L
T ORG C AS C MG/L	00680		3		140	2	L
T ORG C AS C MG/L	00680		4		140	2	L
SODIUM NA, DISS MG/L	00930				130	2	L
CHLORIDE CL, MG/L	00940				21490	2	L
SULFATE SO4, DISS MG/L	00946				140	2	L
IRON FE, DISS UG/L	01046	X					
MANGANESE MN, DISS UG/L	01056				46000	4	L
PHENOLS TOTAL UG/L	32730				4.4	1	R
TOX HALOGEN UG/L	78115		1		3100	2	L
TOX HALOGEN UG/L	78115		2		5540	2	L
TOX HALOGEN UG/L	78115		3		3920	2	L
TOX HALOGEN UG/L	78115		4		4960	2	L
CARBONTET TOT IN WTR UG/L	32102				430	1	L
METHYLENE CHLORIDE T UG/L	34423				7	1	L
TETRACHLOROETHYLENE T UG/L	34475				550	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L
RECEIVED							
JAN 04 1985							

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36 M / D / Y 41) FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER: 0 4 1 8 0 8 0 0 0 1 (9–18)
MONITOR POINT NUMBER (see Instructions): G 1 0 9 (19–22)
REGION: C CO.: DOUGLAS
DATE COLLECTED (23 M): 1 0 / 1 5 / 8 4 (D / Y 28)
LOCATION: TUSCOLA
RESPONSIBLE PARTY: CABOT CORPORATION
IEPA LAB (x or Blank) (see Instructions) (29): MW-9

FOR IEPA USE ONLY
COMPLAINT NO. (30–41):
DATE RECEIVED (42 M / D / Y 47):
SAMPLING PURPOSE CODE (see Instructions) (48):
TIME CARD PROGRAM CODE (49–52) & UNIT CODE (53):

BACKGROUND SAMPLE (X) (54):
TIME COLLECTED (24 HR CLOCK) (55 H : M 58): 1 3 : 1 0
UNABLE TO COLLECT SAMPLE (see Instructions) (59):
MONITOR POINT SAMPLED BY (see Instructions) (60): D
OTHER (SPECIFY):
SAMPLE FIELD FILTERED - INORGANICS (X) (61):
ORGANICS (X) (62):

SAMPLE APPEARANCE (63): T U R B I D
COLLECTOR COMMENTS (102–103): D T W _ M E A S U R E D _ 1 0 / 1 2 _ _ P R I O R _ T O _ W E L L _ P U R G E (142)
SPECIAL INSTRUCTIONS TO LAB:

COLLECTED BY: J. Prewitt — INITIALS (143–145): J P — DIVISION OR COMPANY: Cabot Corp
TRANSPORTED BY: ____ DIVISION OR COMPANY: ____

LAB USE ONLY

LAB SAMPLE NO.: ____ LAB NAME AND ADDRESS: ____ LAB ID NO. (146–149): ____
DATE RECEIVED: ____
TIME RECEIVED: ____
SAMPLE TEMP OKAY (Y/N): ____ SAMPLE PROPERLY PRESERVED (Y/N): ____ DATE COMPLETED: ____ FORWARD: ____
LAB COMMENTS (150–199): ____

SUPERVISOR SIGNATURE: ____

RECORD CODE: L P C S M 0 2 (1–7) TRANS CODE: A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARK CODE	REPLICATE	< OR >	VALUE	REPORTING LEVEL: DIGITS TO THE RIGHT	REPORTING LEVEL: UNIT OF MEASURE
X	DEPTH TO WATER (ft. below LS)	7 2 0 1 9 (10–14)	X (35)	(36)	(37)	2142 (38–47)	2 (48)	R (49)
	ELEVATION OF GW SURFACE (ft. ref MSL)	7 1 9 9 3						
	TOTAL WELL DEPTH (ft. below LS)	7 2 0 0 8						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	0 0 4 3 1						
	REDOX POTENTIAL (millivolt) - Field	0 0 0 9 0						
	pH (units) - Field	0 0 4 0 0						
	SPEC CONDUCTANCE (umhos) - Field	0 0 0 9 4						
V	TEMP OF WATER SAMPLE (°F) - Field	0 0 0 1 1				60.8		

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

IL 532-1218
LPC 100 3/84

002-002

IEPA/DLPC

CHEMICAL ANALYSIS FORM

RECORD CODE [L P C S M 0 2] (1–7) TRANS CODE [A] (8)

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1 (9–18)

MONITOR POINT NUMBER G 1 0 9 (19–22)

ON C CO. DOUGLAS

DATE COLLECTED 10/15/84 (23 M / D / Y 25)

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) 29 MW-9

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CARBONTET TOT IN WTR UG/L	32102 (30–34)	(35)	(36)	< (37)	1 (38–47)	1 (48)	L (49)
METHYLENE CHLORIDE T UG/L	34423			<	1	1	L
TETRACHLOROETHLENE T UG/L	34475				76	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	1	L

RECEIVED

JAN 04 1985

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36 M / D / Y 41)

FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER: 0 4 1 8 0 8 0 0 0 1 (9–18)

MONITOR POINT NUMBER (see Instructions): C 1 1 0 (19–22)

REGION: C CO.: DOUGLAS

DATE COLLECTED (23 M 10 / D 15 / Y 84)

TUSCOLA — LOCATION

CABOT CORPORATION — RESPONSIBLE PARTY

IEPA LAB (x or Blank) (see Instructions): (29)

MW-10

FOR IEPA USE ONLY

COMPLAINT NO.: (30–35)

DATE RECEIVED (42 M / D / Y 47)

SAMPLING PURPOSE CODE (see Instructions): (48)

TIME CARD PROGRAM CODE (49–52) & UNIT CODE (53)

BACKGROUND SAMPLE (X): (54)

TIME COLLECTED (24 HR CLOCK): 13:50 (55 H : M 58)

UNABLE TO COLLECT SAMPLE (see Instructions): (59)

MONITOR POINT SAMPLED BY (see Instructions): 2 (60) PERISTALTIC — OTHER (SPECIFY)

SAMPLE FIELD FILTERED - INORGANICS (X): (61) ORGANICS (X): (62)

SAMPLE APPEARANCE: COLORLESS, CLEAR (63–102)

COLLECTOR COMMENTS: (103–142)

SPECIAL INSTRUCTIONS TO LAB:

J. Dmitt — COLLECTED BY

J P (143–145) — INITIALS

Cabot Corp — DIVISION OR COMPANY

TRANSPORTED BY

DIVISION OR COMPANY

LAB USE ONLY

LAB SAMPLE NO.:

LAB NAME AND ADDRESS:

LAB ID NO. (146–149):

DATE RECEIVED:

TIME RECEIVED:

SAMPLE TEMP OKAY (Y/N):

SAMPLE PROPERLY PRESERVED (Y/N):

DATE COMPLETED:

FORWARD:

LAB COMMENTS (150–199):

SUPERVISOR SIGNATURE

RECORD CODE: L P C S M 0 2 (1–7) TRANS CODE: A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	REMARK CODE (35)	SPECIFICITY (36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: DIGITS TO THE RIGHT OF DECIMAL (45)	REPORTING LEVEL: UNIT OF MEASURE (46)
X	DEPTH TO WATER (ft. below LS)	72019				3.25	2	R
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				62.6	1	R

IEPA/DLPC | CHEMICAL ANALYSIS FORM | Page 2 of 2

RECORD CODE [L | P | C | S | M | 0 | 2] (1–7) TRANS CODE [A] (8)

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1 (9–18)

MONITOR POINT NUMBER G 1 1 0 (19–22)

TION C CO. DOUGLAS

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

DATE COLLECTED 1 0 / 1 5 / 8 4 (23 M / D / Y 25)

IEPA LAB (x or Blank) 29 MW-10

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER (30–34)	(35)	(36)	< OR > (37)	VALUE (38–47)	REPORTING LEVEL: DIGITS (48)	REPORTING LEVEL: CODE OF METHOD (49)
CARBONIET TOT IN WTR UG/L	32102				4	1	L
METHYLENE CHLORIDE T UG/L	34423			<	1	1	L
TETRACHLOROETHYLENE T UG/L	34475				31	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L

RECEIVED
JAN 04 1985

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36 M / D / Y 41) FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER: 0 4 1 8 0 8 0 0 0 1 (9–18)
MONITOR POINT NUMBER (see Instructions): G 1 1 1 (19–22)
REGION: C CO.: DOUGLAS
DATE COLLECTED (23 M / D / Y 28): 1 0 / 1 5 / 8 4
TUSCOLA — LOCATION
CABOT CORPORATION — RESPONSIBLE PARTY
IEPA LAB (x or Blank) (see Instructions) 29: MW-11

FOR IEPA USE ONLY
COMPLAINT NO. 30–41:
DATE RECEIVED (42 M / D / Y 47):
SAMPLING PURPOSE CODE (see Instructions) 48:
TIME CARD
PROGRAM CODE 49–52 & UNIT CODE 53:

BACKGROUND SAMPLE (X) 54:
TIME COLLECTED (24 HR CLOCK) 55 H 56 M: 1320
UNABLE TO COLLECT SAMPLE (see Instructions) 59:
MONITOR POINT SAMPLED BY (see Instructions) 60: 2 PERISTALTIC — OTHER (SPECIFY)
SAMPLE FIELD FILTERED - INORGANICS (X) 61: ORGANICS (X) 62:

SAMPLE APPEARANCE 63–102: TURBID
COLLECTOR COMMENTS 103–142:
SPECIAL INSTRUCTIONS TO LAB

J Pmith — COLLECTED BY
J P — INITIALS 143–145
Cabot Corp — DIVISION OR COMPANY
TRANSPORTED BY
DIVISION OR COMPANY

LAB USE ONLY
LAB SAMPLE NO.
LAB NAME AND ADDRESS
LAB ID NO. 146–149
DATE RECEIVED
TIME RECEIVED
SAMPLE TEMP OKAY (Y/N)
SAMPLE PROPERLY PRESERVED (Y/N)
DATE COMPLETED
FORWARD
LAB COMMENTS 150–199:
SUPERVISOR SIGNATURE

RECORD CODE: L P C S M 0 2 (1–7) TRANS CODE: A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARK SELECT	REMARK CODE	< OR >	VALUE	REPORTING LEVEL: DIGITS TO THE RIGHT OF DECIMAL	REPORTING LEVEL: CODE FOR DECIMAL
X	DEPTH TO WATER (ft. below LS)	72019 (30–34)	35	36	37	433 (35–37)	2 (38)	R (39)
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				626	1	R

IEPA/DLPC

CHEMICAL ANALYSIS FORM

RECORD CODE L P C S M 0 2 TRANS CODE A

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER G 1 1 1

ION C CO. DOUGLAS

DATE COLLECTED 1 0 1 5 8 4

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) MW-11

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CARBONTET TOT IN WTR UG/L	34102				3	1	L
METHYLENE CHLORIDE T UG/L	34423			≤	1	1	L
TETRACHLOROETHYLENE T UG/L	34475				30	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			≤	10	2	L

RECEIVED
JAN 04 1985
IEPA-DLPC

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE: L P C S M 0 1 (1–7) TRANS CODE: A (8)

REPORT DUE DATE (36) M / D / Y (41) FEDERAL ID NUMBER: I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER: 0 4 1 8 0 8 0 0 0 1 (9–18)
MONITOR POINT NUMBER (see Instructions): C 1 1 2 (19–22)
REGION: C CO. DOUGLAS
DATE COLLECTED (23) M: 10 / D: 15 / Y: 84 (25)
TUSCOLA — LOCATION
CABOT CORPORATION — RESPONSIBLE PARTY
IEPA LAB (x or Blank) (see Instructions) (29): MW-12

FOR IEPA USE ONLY
COMPLAINT NO. (30–35):
DATE RECEIVED (42) M / D / Y (47)
SAMPLING PURPOSE CODE (see Instructions) (48)
TIME CARD
PROGRAM CODE (49–52) & UNIT CODE (53)

BACKGROUND SAMPLE (X) (54)
TIME COLLECTED (24 HR CLOCK) (55) H: 14 : M: 22 (56)
UNABLE TO COLLECT SAMPLE (see Instructions) (59)
MONITOR POINT SAMPLED BY (see Instructions) (60): 2 PERISTALTIC — OTHER (SPECIFY)
SAMPLE FIELD FILTERED - INORGANICS (X) (61) ORGANICS (X) (62)

SAMPLE APPEARANCE (63–102): COLORLESS, SLIGHTLY TURBID
COLLECTOR COMMENTS (103–142):
SPECIAL INSTRUCTIONS TO LAB:

J. Pruett — COLLECTED BY
J P (143–145) — INITIALS
Cabot Corp — DIVISION OR COMPANY
TRANSPORTED BY
DIVISION OR COMPANY

LAB USE ONLY

LAB SAMPLE NO.
LAB NAME AND ADDRESS
LAB ID NO. (146–149)
DATE RECEIVED
TIME RECEIVED
SAMPLE TEMP OKAY (Y/N)
SAMPLE PROPERLY PRESERVED (Y/N)
DATE COMPLETED
FORWARD
LAB COMMENTS (150–199)
SUPERVISOR SIGNATURE

RECORD CODE L P C S M 0 2 (1–7) TRANS CODE A (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARK CODE	QUALIFIER	< OR >	VALUE	REPORTING LEVEL: DETECTION LIMIT	REPORTING LEVEL: SIGNIFICANT FIGURES
X	DEPTH TO WATER (ft. below LS)	72019 (36–39)	(35)	(36)	(37)	5.00 (38)	2 (45)	R (46)
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				60.8	1	R

IEPA/DLPC

CHEMICAL ANALYSIS FORM

RECORD CODE L P C S M 0 2 TRANS CODE A

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER G 1 1 2

REGION C CO. DOUGLAS

DATE COLLECTED 10/15/84

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) MW-12

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CARBONTET TOT IN WTR UG/L	32102				2	1	L
METHYLENE CHLORIDE T UG/L	34423			≤	1	1	L
TETRACHLOROETHYLENE T UG/L	34475				20	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			≤	10	1	L

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
CHEMICAL ANALYSIS FORM

RECORD CODE [L|P|C|S|M|0|1] (1–7) TRANS CODE [A] (8)

REPORT DUE DATE (36) M__/__D__/__Y(41) FEDERAL ID NUMBER I L D 0 4 2 0 7 5 3 3 3

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1 (9–18) MONITOR POINT NUMBER (see Instructions) G 1 1 3 (19–22)

REGION C CO. DOUGLAS DATE COLLECTED (23) M 10 / D 15 / Y 84 (28)

TUSCOLA (LOCATION) CABOT CORPORATION (RESPONSIBLE PARTY) IEPA LAB (x or Blank) (see Instructions) (29) MW-13

FOR IEPA USE ONLY COMPLAINT NO. (30–35)

DATE RECEIVED (42) M__/__D__/__Y(47)

SAMPLING PURPOSE CODE (see Instructions) (48)

TIME CARD PROGRAM CODE (49–52) & UNIT CODE (53)

BACKGROUND SAMPLE (X) (54) TIME COLLECTED (24 HR CLOCK) (55) H 13 M 40 (58)

UNABLE TO COLLECT SAMPLE (see Instructions) (59)

MONITOR POINT SAMPLED BY (see Instructions) (60) D OTHER (SPECIFY)

SAMPLE FIELD FILTERED - INORGANICS (X) (61) ORGANICS (X) (62)

SAMPLE APPEARANCE (63–82) COLORLESS SLIGHTLY TURBID

COLLECTOR COMMENTS (83–102) DTW MEASURED 10/12 PRIOR TO WELL PURGE (103–142)

SPECIAL INSTRUCTIONS TO LAB

J P Smith (COLLECTED BY) J P (INITIALS) (143–145) Cabot Corp (DIVISION OR COMPANY) ____ (TRANSPORTED BY) ____ (DIVISION OR COMPANY)

LAB USE ONLY

LAB SAMPLE NO. ____ LAB NAME ____ LAB ID NO. (146–149)

DATE RECEIVED ____ AND ADDRESS ____

TIME RECEIVED ____

SAMPLE TEMP OKAY (Y/N) SAMPLE PROPERLY PRESERVED (Y/N) DATE COMPLETED ____ FORWARD ____

LAB COMMENTS (150–199)

SUPERVISOR SIGNATURE

RECORD CODE [L|P|C|S|M|0|2] (1–7) TRANS CODE [A] (8)

	FIELD MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER	REMARK CODE	RESULT CODE	< OR >	VALUE	REPORTING LEVEL: DIGITS TO L OR R	REPORTING LEVEL: L OR R OF DECIMAL
X	DEPTH TO WATER (ft. below LS)	72019 (30–34)	X (35)	(36)	(37)	11.75 (35–37)	2 (38)	R (39)
	ELEVATION OF GW SURFACE (ft. ref MSL)	71993						
	TOTAL WELL DEPTH (ft. below LS)	72008						
	ALKALINITY TOTAL (mg/l as CaCO3) - Field	00431						
	REDOX POTENTIAL (millivolt) - Field	00090						
	pH (units) - Field	00400						
	SPEC CONDUCTANCE (umhos) - Field	00094						
	TEMP OF WATER SAMPLE (°F) - Field	00011				608	1	R

This Agency is authorized to require this information under Illinois Revised Statutes 1979 Chapter 111 1/2 Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

IL 532-1218

IEPA/DLPC

CHEMICAL ANALYSIS FORM

RECORD CODE L P C S M 0 2 TRANS CODE A

SITE INVENTORY NUMBER 0 4 1 8 0 8 0 0 0 1

MONITOR POINT NUMBER G 1 1 3

REGION C CO. DOUGLAS

DATE COLLECTED 1 0 / 1 5 / 8 4

TUSCOLA / CABOT CORPORATION

LOCATION RESPONSIBLE PARTY

IEPA LAB (x or Blank) MW-13

LAB MEASUREMENTS CONSTITUENT DESCRIPTION AND REQUIRED UNIT OF MEASURE	STORET NUMBER			< OR >	VALUE	REPORTING LEVEL	
CARBONTET TOT IN WTR UG/L	32102			<	1	1	L
METHYLENE CHLORIDE T UG/L	34423			<	1	1	L
TETRACHLOROETHYLENE T UG/L	34475			<	1	1	L
BIS (2-ETHHEX) PHTH T W UG/L	39100			<	10	2	L

FREQUENCY OF SAMPLING AND PARAMETERS
TO BE ANALYZED

Based on the analyses of both the groundwater samples from the monitoring wells and waste fluid sample from the impoundment, the IEPA had approved the list containing four hazardous waste constituents to be analyzed in the water samples taken from the monitoring wells at the Cabot Corporation plant. The approval was granted in May 1984. Subsequent to this, the analyses made for the quarterly and annual assessments indicated a total of nine additional parameters above their respective detection limits in groundwater. Of the nine, four parameters were measurable in the two assessments and five parameters were not. The three parameters out of four are listed by the IPCB under the "Hazardous Waste Constituents" list. Thus, Cabot Corporation proposes to modify Part C of "Frequency of Sampling and Parameters to be Analyzed", which was submitted to the IEPA on May 5, 1984, as below. Parts A and B will not be changed.

A. Wells #1, 6, 7 and 8 in the monitoring system will be sampled annually and the samples will be analyzed for the Groundwater Quality Parameters (Section 725.192 (b) (2)).

B. Wells #1, 6, 7 and 8 will be sampled semi-annually and the samples will be analyzed for Indicator Parameters (Section 725.192 (b) (3)) in quadruplicate.

C. All wells in the monitoring system will be sampled quarterly and the samples will be analyzed for the seven hazardous

waste constituents and the analysis results will be reported (Table 2R). Furthermore, if any compounds of volatile organics, base/neutral extractables, acid extractables, and pesticides and PCB's are found to be above their respective detection limits, they will be reported quarterly to the IEPA.

MONITORING SYSTEM

Presently, the monitoring system at the Cabot Corporation plant, Tuscola, Illinois consists of seven shallow and two relatively deep monitoring wells. Based on the quarterly groundwater assessments of the regional flow direction and well depths in conjunction with chemical analysis, it appears that the existing monitoring system needs to be expanded to determine vertical and horizontal extent of the contamination. Thus, Cabot Corporation proposes the addition of one deep and two shallow wells to the existing monitoring system. Number and approximate locations of the proposed wells are shown in the attached map.

1. Vertical Extent

   G114 will be located just east of G106 and drilled to 75 ft.

2. Horizontal Extent

   Two shallow wells (G115 and G116), approximately 20 ft deep, will be located along the southeast fence line.

All the proposed wells will be constructed similar to the wells, G109, G110, G111, G112 and G113 which were installed in April 1984.

However, their depths and screen intervals would be different. The proposed monitoring wells will be drilled with a hollow stem auger. Machine-slotted PVC screen and casing of 2-inch diameter will be installed in the wells. Flush threaded casing and screens will be used to avoid potential sample contamination by PVC cleaner and glue. After backfilling the screened interval with clean quartz sand, the wells will be backwashed by pumping municipal water down the well casing and out of the screen to remove silt and clay from the sand pack. The annulus will then be filled to the three ft below the land surface with cement/bentonite grout and a lockable steel cover will be set in three ft concrete around the PVC casing to provide well protection.

G114 will be drilled to a depth of 75 ft. A 5-ft screen will be placed at the 70 to 75 ft and a 70 to 75 ft riser pipe installed above the screen in the well so that water would be sampled from only 70 to 75 ft depth interval. G115 and G116 will be located along the fence line which is present east and southeast of the plant. These wells will be drilled to an approximate depth of 20 ft. A 10-ft long screen and 10 to 15 ft riser pipes will be installed in these wells.

Table 2R. Paremeters to be analyzed, sample containers, preservation procedures, and frequency of sampling

PARAMETER	CONTAINER	PRESERVATIVE	HOLDING TIME	FREQUENCY OF SAMPLING
WATER QUALITY				
Chloride	P,G**	Cool, 4° C	7 days	Annually
Iron	P,G	HNO^3 to pH< 2	6 months	Annually
Manganese	P,G	HNO^3 to pH< 2	6 months	Annually
Phenols	G	H^2SO_4 to pH< 2	24 hours	Annually
Sodium	P,G	HNO^3 to pH< 2	6 months	Annually
Sulfate	P,G	Cool, 4° C	7 days	Annually
* CONTAMINATION INDICATORS				
pH	P,G	Det.on site Cool, 4° C	6 hours	Semi-Annually
Specific Conductance	P,G	Cool, 4° C	24 hours	Semi-Annually
Total Organic Carbon	P,G	HCl to pH< 2 Cool, 4° C	24 hours	Semi-Annually
Total Organic Halogen	G	Cool, 4° C	7 days	Semi-Annually
HAZARDOUS WASTE CONSTITUENTS	G	Cool, 4° C		
Bis(2-Ethyl-Hexyl) phthalate				Quarterly
Carbon tetrachloride				Quarterly
Methylene chloride				Quarterly
Tetrachloroethylene				Quarterly
Benzene				Quarterly
Toluene				Quarterly
Chloroform				Quarterly

* Four replicate meaurements will be made on each sample from each well

RECEIVED* P,G Plastic or Glass

JAN 04 1985

EPA-DLPC